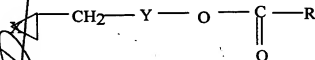


What Is Claimed Is:

1. A thermosetting resin composition, reaction products of which are controllably degradable, said composition comprising:

(a) a curable resin component selected from the group consisting of curable resins having at least two heteroatom-containing carbocyclic structures pending from a core structure, with the core structure containing at least one ether, thioether or carbonate linkage that is capable of degrading upon exposure to elevated temperature conditions and/or acidic conditions, epoxy resins, at least a portion of which having at least one alkylene oxide residue positioned adjacent at least one terminal epoxy group and the combination of an epoxy resin and a coreactant diluent represented by the structure:



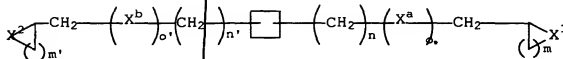
wherein X represents the heteroatoms, oxygen or sulfur; Y may or may not be present, and when present represents alkyl, alkenyl, and aryl; and R represents alkyl, alkenyl, and aryl; and

(b) a curing agent component.

2. The composition of Claim 1, further comprising an anhydride component.

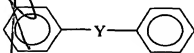
3. The composition of Claim 1, further comprising an inorganic filler component.

4. The composition of Claim 1, wherein the curable resin component is represented by the following structure:



wherein the box represents one or more aromatic ring(s) or ring system(s), with or without interruption or substitution by one or more heteroatoms; X^1 , X^2 , X^a , and X^b may be the same or different and represent oxygen and sulfur; m and m^1 represent integers within the range of 1 to 3; n and n^1 represent integers within the range of 0 to 8; and o and o^1 represent integers within the range of 1 to 3.

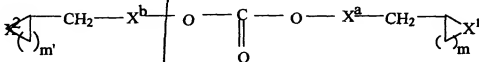
5. The composition of Claim 4, wherein the box is represented by



wherein Y may or may not be present, and where present a member selected from the group consisting of carbon, oxygen, sulfur, and phenylene.

6. The composition of Claim 4, wherein the box represents a structural linkage selected from the group consisting of individual aromatic rings, oligomeric systems and aromatic ring systems having multiple aromatic units joined in fused ring systems, joined in bi-aryl ring systems, bis-aryl ring systems, or cycloaliphatic-aromatic hybrid ring systems.

7. The composition of Claim 1, wherein the curable resin component is represented by the following structure:

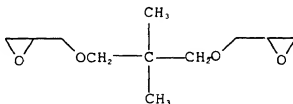


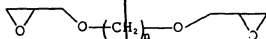
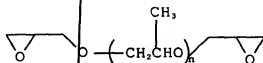
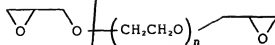
wherein X^1 and X^2 may be the same or different and represent oxygen and sulfur; X^a and X^b may be the same or different, may or may not be present, and represent alkyl, alkenyl, and aryl of one to about twenty carbon atoms, or one or more aromatic ring(s) or ring system(s), with or without interruption or substitution by one or more heteroatoms; and m and m^1 represent integers within the range of 1 to 3.

8. The composition of Claim 1, wherein the curable resin component is a member selected from the group consisting of MPG [bis[4-(2,3-epoxy-propylthio)phenyl]-sulfide], XBO [xylene bisoxetane], CBO (carbonate bisoxetane), and combinations thereof.

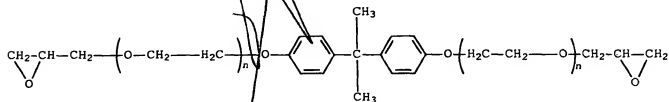
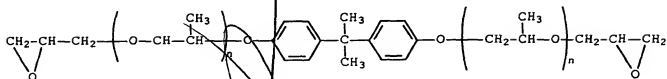
9. The composition of Claim 1, wherein the epoxy resin component includes mono- or multi-functional aliphatic epoxies, epoxies with a cycloaliphatic ring structure or system, or epoxies with an aromatic ring structure or system, and combinations thereof.

10. The composition of Claim 1, wherein the epoxy resin component includes

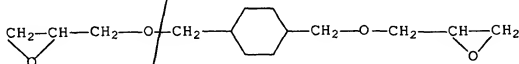




wherein n is an integer from 1 to about 18,

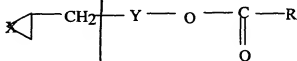


wherein n is as defined above,



and combinations thereof.

11. The composition of Claim 1, wherein the coreactant diluent is represented by the structure:



wherein X represents the heteroatoms, oxygen or sulfur; Y may or may not be present, and when present represents a linkage selected from the group consisting of linear, branched, cyclo or bicyclo alkyl or alkenyl of from one or two, respectively, to about twenty carbon atoms, and aryl of one or more aromatic ring(s) or ring system(s) of from about six to about twenty carbon atoms.

12. The composition of Claim 1, wherein the coreactant diluent is glycidyl neodecanoate.

13. The composition of Claim 1, wherein the curing agent component is a member selected from the group consisting of amine compounds, amide compounds, imidazole compounds, and derivatives and combinations thereof.

14. The composition of Claim 13, wherein the amine compounds are selected from the group consisting of aliphatic polyamines, aromatic polyamines, alicyclic polyamines and combinations thereof.

15. The composition of Claim 13, wherein the amine compounds are selected from the group consisting of diethylenetriamine, triethylenetetramine, diethylaminopropylamine, xylenediamine, diaminodiphenylamine, isophoronediamine, menthenediamine and combinations thereof.

16. The composition of Claim 13, wherein the amide compounds include cyano-functionalized amides.

17. The composition of Claim 13, wherein the imidazole compounds are selected from imidazole, isoimidazole, alkyl-substituted imidazoles, and combinations thereof.

18. The composition of Claim 13, wherein the imidazole compounds are selected from 2-methyl imidazole, 2-ethyl-4-methylimidazole, 2,4-dimethylimidazole, butylimidazole, 2-heptadecenyl-4-methylimidazole, 2-methylimidazole, 2-undecenylimidazole, 1-vinyl-2-methylimidazole, 2-n-heptadecylimidazole, 2-undecylimidazole, 2-heptadecylimidazole, 2-ethyl 4-methylimidazole, 1-benzyl-2-methylimidazole, 1-propyl-2-methylimidazole, 1-cyanoethyl-2-methylimidazole, 1-cyanoethyl-2-ethyl-4-methylimidazole, 1-cyanoethyl-2-undecylimidazole, 1-cyanoethyl-2-phenylimidazole, 1-guanaminoethyl-2-methylimidazole and addition products of an imidazole and trimellitic acid, 2-n-heptadecyl-4-methylimidazole, aryl-substituted imidazoles, phenylimidazole, benzylimidazole, 2-methyl-4,5-diphenylimidazole, 2,3,5-triphenylimidazole, 2-styrylimidazole, 1-(dodecyl benzyl)-2-methylimidazole, 2-(2-hydroxyl-4-t-butylphenyl)-4,5-diphenylimidazole, 2-(2-methoxyphenyl)-4,5-diphenylimidazole, 2-(3-hydroxyphenyl)-4,5-diphenylimidazole, 2-(p-dimethylaminophenyl)-4,5-diphenylimidazole, 2-(2-hydroxyphenyl)-4,5-diphenylimidazole, di(4,5-diphenyl-2-imidazole)-benzene-1,4, 2-naphthyl-4,5-diphenylimidazole, 1-benzyl-2-methylimidazole, 2-p-methoxystyrylimidazole, and combinations thereof.

19. The composition of Claim 13, wherein the modified amine compounds include epoxy amine additives formed by the addition of an amine compound to an epoxy compound.

20. The composition of Claim 13, wherein the modified amine compounds include "ANCAMINE" 2337S.

21. The composition of Claim 13, wherein the modified amine compounds are novolac-type resin modified through reaction with aliphatic amines.

22. The composition of Claim 13, wherein the modified imidazole compounds include imidazole adducts formed by the addition of an imidazole compound to an epoxy compound.

23. The composition of Claim 2, wherein the anhydride component is a member selected from the group consisting of hexahydrophthalic anhydride, methyl hexahydrophthalic anhydride, 5-(2,5-dioxotetrahydrol)-3-methyl-3-cyclohexene-1,2-dicarboxylic anhydride, and combinations thereof.

24. The composition of Claim 3, wherein the inorganic filler component is a member selected from the group consisting of silica, aluminum oxide, silicon nitride, aluminum nitride, silica-coated aluminum nitride, boron nitride and combinations thereof.

25. A thermosetting resin composition capable of sealing underfilling between a semiconductor device including a semiconductor chip mounted on a carrier substrate and a circuit board to which said semiconductor device is

electrically connected, or a semiconductor chip and a circuit board to which said semiconductor chip is electrically connected, reaction products of which are capable of softening and losing adhesiveness comprising:

a curable resin component as set forth in Claim 1 in an amount in the range of from about 20% by weight to about 60% by weight, a curing agent component in an amount within the range of from about 1 to about 10% by weight, and optionally an anhydride component in an amount within the range of from about 10 to about 60% by weight, and optionally an inorganic filler component in an amount up to about 60% by weight.

26. Reaction products of the compositions in accordance with any one of Claims 1-25.

27. An electronic device comprising a semiconductor device and a circuit board to which said semiconductor device is electrically connected or a semiconductor chip and a circuit board to which said semiconductor chip is electrically connected, assembled using a thermosetting resin composition according to any one of Claims 1-25 as an underfill sealant between the semiconductor device and the circuit board or the semiconductor chip and the circuit board, respectively, wherein reaction products of the composition are capable of softening and losing their adhesiveness under exposure to temperature conditions in excess of those used to cure the composition.

28. A method of sealing underfilling between a semiconductor device including a semiconductor chip mounted on a carrier substrate and a circuit board to which said

semiconductor device is electrically connected or a semiconductor chip and a circuit board to which said semiconductor chip is electrically connected, the steps of which comprise:

(a) dispensing into the underfilling between the semiconductor device and the circuit board or the semiconductor chip and the circuit board a composition in accordance with any one of Claims 1-25; and

(b) exposing the composition as so dispensed to conditions appropriate to cause the composition to form a reaction product.

29. A method of reworking a reaction product of a composition in accordance with any one of Claims 1-25, a step of which comprises:

(a) exposing the reaction product to conditions appropriate to cause the reaction product to soften and lose adhesiveness.

30. The method according to Claim 29, further comprising the steps of:

(b) removing the semiconductor chip or semiconductor device from the circuit board; and

(c) optionally, cleaning the surface of the circuit board to remove any cured reaction product that remains.

Add A1